Panel Session I - A Vision of Exploration: Catalyzed by Science

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A Vision of Exploration: Catalyzed by Science

Dr. Jim Garvin
NASA Lead Scientist for Mars and Moon
Space Congress
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National Aeronautics and Space Administration

Vision
- Our mandate is:
  • To improve life here,
  • To extend life to there,
  • To find life beyond

Mission
- To understand and protect our home planet
- To explore the Universe and search for life
- To inspire the next generation of explorers... as only NASA can

Exploration... Discovery... Knowledge → Science

Humans “on site” Enable Discoveries: Apollo Mars

1969 - 1972
Couldn’t Be Done, Right?
Amidst a Scientific Revolution...

Science Drivers Determine Vantage Points (Example)

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<th>Science Questions</th>
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<th>Activities</th>
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<td>- History of major Solar System events</td>
<td>- Planetary sample analysis</td>
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<td>- Effects of deep space on cells</td>
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<td>Sun-Earth L2</td>
<td>What is Earth's availability and habitability?</td>
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<td>Mars Exploration</td>
<td>Origin of life in the Solar System</td>
<td>- Origin of life in the Universe</td>
<td>- Detection of biomarkers and hospitable environments</td>
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To Explore the Universe and Search for Life

EXPLORATION "Science"

Science Pathways for Human Exploration of Moon/Mars involve all 3 facets

Many pathways to Discovery...

Earth's Moon and Mars... gateways to the Search for Life on Planetary Surfaces
The Moon: Preparing for Humanity's Greatest Journey

Contrary to Popular Belief, we have much to learn about the Moon (as with Africa).

Another world beyond the Earth and Moon awaits human exploration and investigation.

The Moon is where humans train for the grandest future...the exploration of Mars. They search for the water persisted by cosmic events...and perhaps the timing of those events in the history of the...
Humans & Robots on the Moon as Agents of Discovery...Again!

Getting to and sampling the right soils to make scientific breakthroughs [even in Astrobiology]

Discovering the ice hidden deep and hard work on a icy, frozen planet (Apollos 17)

Mars: A Complex Planet

Comparative Planetology
- Climate Change
- Surface Geology
- Atmosphere Processes
- Subsurface Reservoirs

First Footsteps

Opportunity

Spirit

Where we landed our two MER vehicles... safe with good science value
Where we might want to go...

- South polar layered terrain
- Exposed "dikes" from within martian pluton
- Holden NE "delta"

Mars: Human-based Sampling...

In Situ Analysis Method

- Modern Biofilm
- Fossil Biofilm

SEM of materials could be done on Mars... then on Earth

Mars: our next "America"... terra incognita

Some icy -- the terra incognitas of planetary surfaces in search of the origins of life...

Laying the Foundation for Future Campaign of Global Mars Surface Exploration
3.5my 1969 ?

Not If, But When & Who

- Exploration is all about partnership
- Enabling technological solutions (mobility, human access) catalyzes scientific discoveries (Apollo, MER,...)

We do it all the time here at "home"... Mars on Earth